



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. FAA-2019-0618; Special Conditions No. 23-295-SC]

Special Conditions: Pilatus Aircraft Ltd., Model PC-12/47E Airplanes; Electronic Engine Control System Installation

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions; request for comments.

SUMMARY: These special conditions are issued for the Pilatus Aircraft Ltd., Model PC-12/47E airplane. This airplane will have a novel or unusual design feature associated with installation of an engine that includes an electronic engine control system. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: The effective date of these special conditions is **[INSERT DATE OF PUBLICATION IN FEDERAL REGISTER]**.

The FAA must receive your comments by **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**

ADDRESSES: Send comments identified by docket number FAA-2019-0618 using any of the following methods:

- ☐ Federal eRegulations Portal: Go to <http://www.regulations.gov> and follow the online instructions for sending your comments electronically.
- ☐ Mail: Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE, Room W12-140, West Building Ground Floor, Washington, D.C., 20590-0001.
- ☐ Hand Delivery of Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, S.E., Washington, D.C., between 9 a.m., and 5 p.m., Monday through Friday, except Federal holidays.
- ☐ Fax: Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://regulations.gov>, including any personal information the commenter provides. Using the search function of the docket web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the Federal Register published on April 11, 2000 (65 FR 19477-19478).

Docket: Background documents or comments received may be read at <http://www.regulations.gov> at any time. Follow the online instructions for accessing the docket or go to the Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, D.C., between 9 a.m., and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Jeff Pretz, AIR-691, Small Airplane

Standards Branch, Policy & Innovation Division, Aircraft Certification Service, Federal Aviation Administration, 901 Locust, Room 301, Kansas City, MO, 64106; telephone (816) 329-3239; facsimile (816) 329-4090.

SUPPLEMENTARY INFORMATION:

Reason for No Prior Notice and Comment Before Adoption

The FAA has determined, in accordance with 5 U.S. Code §§ 553(b)(3)(B) and 553(d)(3), that notice and opportunity for prior public comment hereon are unnecessary because substantially identical special conditions have been subject to the public comment process in several prior instances such that the FAA is satisfied that new comments are unlikely. For the same reason, the FAA finds that good cause exists for making these special conditions effective upon issuance. The FAA is requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment.

Special Conditions Number	Company/Airplane Model
23-253-SC ¹	Diamond Aircraft Industries/Model DA-40NG
23-267-SC ²	Cirrus Design Corporation/Model SF50
23-282-SC ³	Pilatus Aircraft Ltd./Model PC-24
23-292-SC ⁴	Costruzioni Aeronautiche Tecnam S.P.A./Model P2012

Comments Invited

The FAA invites interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special

¹http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSC.nsf/0/1A102658468C62D386257950004D7183?OpenDocument

²<https://www.govinfo.gov/app/details/FR-2015-09-23/2015-24156/summary>

³<https://www.govinfo.gov/app/details/FR-2017-07-17/2017-14936>

⁴ <https://www.federalregister.gov/documents/2019/04/26/2019-08476/special-conditions-costruzioni-aeronautiche-tecnam-spa-model-p2012-airplane-electronic-engine>

conditions, explain the reason for any recommended change, and include supporting data. The FAA asks that you send two copies of written comments.

The FAA will consider all comments received on or before the closing date for comments. The FAA will consider comments filed late if it is possible to do so without incurring expense or delay. The FAA may change these special conditions based on the comments received.

Background

On March 9, 2017, Pilatus Aircraft Ltd. (Pilatus) applied for FAA validation of its change to Type Certificate No. A78EU⁵ for installation of an electronic engine control (EEC) system—commonly referred to as a full authority digital engine control (FADEC)—in the Model PC-12/47E airplane. The Model PC-12/47E is a normal category, metallic, pressurized, low-wing, monoplane that seats nine passengers and two flightcrew. A single Pratt & Whitney PT6E-67XP⁶ engine driving a five bladed variable pitch constant speed Hartzell propeller powers the airplane. The airplane has retractable tricycle landing gear, a Honeywell Primus APEX avionics suite, and a maximum takeoff weight of 10,450 pounds.

The Model PC-12/47E is equipped with a single Pratt & Whitney PT6E-67XP that uses an EEC system instead of a traditional mechanical control system. Although the EEC is certificated with the engine, the installation of an EEC requires evaluation due to critical environmental effects and possible effects on or by other airplane systems such as indirect effects of lightning, radio interference with other airplane electronic systems, and shared engine, airplane data, and power sources.

⁵ See http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgMakeModel.nsf/0/019EED2BA802A848862583360061A683?OpenDocument&Highlight=a78eu

⁶ As of this special condition publishing date, engine approval is in process. The final engine model number will be updated on Type Certification Data Sheet A78EU upon engine approval completion.

Sections 23.1306, 23.1308, and 23.1309 contain requirements for evaluating the installation of complex systems, including electronic systems and critical environmental effects. However, the use of EECs for engines was not envisioned when § 23.1309 was published. The integral nature of these systems makes it necessary to ensure proper evaluation of the airplane functions, which may be included in the EEC, and that the installation does not degrade the EEC reliability approved under part 33 during engine type certification. Sections 23.1306(a) and 23.1308(a) apply to the EEC to ensure it remains equivalent to a mechanical only system, which is not generally susceptible to the High Intensity Radiated Fields (HIRF) and lightning environments.

In some cases, the airplane in which the engine is installed determines a higher classification than the engine controls are certificated for, requiring the EEC systems be analyzed at a higher classification. As of November 2005, EEC special conditions mandated the § 23.1309 classification for loss of EEC control as catastrophic for any airplane. This is not to imply an engine failure is classified as catastrophic, but that the EEC must provide an equivalent reliability to mechanical engine controls. In addition, §§ 23.1141(e) and 25.901(b)(2) provide the fault tolerant design requirements of turbine engine mechanical controls to the EEC and ensure adequate inspection and maintenance intervals for the EEC.

Part 23 did not envision the use of full authority EECs and lacks the specific regulatory requirements necessary to provide an adequate level of safety. Therefore, special conditions are necessary.

Type Certification Basis

Under the provisions of 14 CFR 21.101, Pilatus must show that the Model PC-12/47E airplane, as changed, continues to meet the applicable provisions of the regulations incorporated

by reference in Type Certificate No. A78EU or the applicable regulations in effect on the date of application for the change. The regulations incorporated by reference in the type certificate are commonly referred to as the “original type certification basis.” In addition to the original type certification basis, the FAA has determined that the Model PC-12/47E must also comply with § 23.905(d) as amended by amendment 23-59, § 23.1306 as amended by amendment 23-61, § 23.1308 as amended by amendment 23-57, and §§ 23.1309 and 23.1310 as amended by amendment 23-62.

If the Administrator finds that the applicable airworthiness regulations in part 23 do not contain adequate or appropriate safety standards for the Model PC-12/47E airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

The FAA issues special conditions, as defined in § 11.19, under § 11.38 and they become part of the type certification basis under § 21.101.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design feature, the FAA would apply these special conditions to the other model.

In addition to the applicable airworthiness regulations and special conditions, the Model PC-12/47E must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36; and the FAA must issue a finding of regulatory adequacy under § 611 of Public Law 92-574, the "Noise Control Act of 1972."

Novel or Unusual Design Features

The Model PC-12/47E airplane will incorporate the following novel or unusual design features:

The installation of an EEC system, which is the generic family of electrical/electronic engine control systems to include full authority digital engine controls, supervisory controls, and derivatives of these controls.

Discussion

This airplane makes use of an electronic engine control system instead of a traditional mechanical control system, which is a novel design for this type of airplane. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. Mandating a structured assessment to determine potential installation issues mitigate concerns that the addition of an electronic engine control does not produce a failure condition not previously considered.

Applicability

These special conditions are applicable to the Model PC-12/47E airplane. Should Pilatus apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the FAA would apply these special conditions to that model as well.

Conclusion

This action affects only a certain novel or unusual design feature on the Model PC-12/47E airplane. It is not a rule of general applicability.

List of Subjects in 14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

Citation

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40113, 44701-44702; Pub. L. 113-53, 127 Stat 584 (49 U.S.C. 44704) note.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Pilatus Aircraft Ltd. Model PC-12/47E airplanes.

Installation of Electronic Engine Control System

(a) For electronic engine control (EEC) system installations, it must be established that no single failure or malfunction or probable combinations of failures of EEC system components will have an effect on the system, as installed in the airplane, that causes the Loss of Power Control (LOPC) probability of the system to exceed those allowed in part 33 certification.

(b) Electronic engine control system installations must be evaluated for environmental and atmospheric conditions, including lightning and High Intensity Radiated Fields (HIRF). The EEC system lightning and HIRF effects that result in LOPC should be considered catastrophic.

(c) The components of the installation must be constructed, arranged, and installed to ensure their continued safe operation between normal inspections or overhauls.

(d) Functions incorporated into any electronic engine control that make it part of any equipment, systems or installation whose functions are beyond that of basic engine control, and which may also introduce system failures and malfunctions, are not exempt from

§ 23.1309 and must be shown to meet part 23 levels of safety as derived from § 23.1309.

Part 33 certification data, if applicable, may be used to show compliance with any part 23 requirements. If part 33 data is used to substantiate compliance with part 23 requirements, then the part 23 applicant must be able to provide this data for its showing of compliance.

Note: The term "probable" in the context of "probable combination of failures" does not have the same meaning as used for a safety assessment process. The term "probable" in "probable combination of failures" means "foreseeable," or those failure conditions anticipated to occur one or more times during the operational life of each airplane.

Issued in Kansas City, Missouri on August 9, 2019.

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Policy and Innovation Division
Aircraft Certification Service
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